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HIV/AIDS Cost Study: Construct Validity and Factor Structure of the PTSD Checklist in Dually Diagnosed HIV-Seropositive Adults

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ABSTRACT. Published findings are mixed regarding the underlying factor structure of the PTSD Checklist (PCL). Studies have found two-, three-, and four-factor solutions, which are only partially consistent with

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DSM-IV-defined PTSD symptom clusters (reexperiencing, avoidance, and hyperarousal). The current study examined the reliability, validity, and factor structure of the PCL in a sample of dually diagnosed (substance use disorder and other psychiatric disorder) participants living with HIV/AIDS. Results supported the robust psychometric properties of the PCL, with high reliability and validity. Using confirmatory factor analysis, two models, a second-order (two-factor) and a first-order (four- factor) solution were supported. The utility of the PCL and implications for the dimensionality of PTSD in this population are discussed doi:10.1300/J189v05n04_02

KEYWORDS. PTSD Checklist, PCL, HIV, psychometric properties, confirmatory factor analysis, CFA

INTRODUCTION

Considerable work has been done to assess the psychometric properties of the PTSD Checklist (PCL) across various populations including predominantly female motor vehicle and sexual assault victims (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996), adults in primary care settings (Cook, Elhai, & Arean, 2005), female veterans in primary care (Lang, Laffaye, Satz, Dresselhaus, & Stein, 2003), individuals with severe mental illness (Mueser et al., 2001), college students (Ruggiero, Del Ben, Scotti, & Rabalais, 2003), cancer survivors (DuHamel et al., 2004; Shelby, Golden-Kreutz, & Andersen, 2005; Smith, Redd, DuHamel, Vickberg, & Ricketts, 1999), and combat veterans (Weathers, Litz, Herman, Huska, & Keane, 1993). However, there are no published studies available that describe the properties of this instrument in the HIV population, despite evidence suggesting that the prevalence of Posttraumatic Stress Disorder (PTSD) is elevated in this cohort. Rates of PTSD among individuals living with HIV have been reported to range from 35 to 42% (Kelly et al., 1998; Kimerling et al., 1999; Martinez, Israelski, Walker, & Koopman, 2002). These rates of PTSD are notably higher than the 7 to 10% prevalence rate for the disorder found in the general population (Breslau et al., 1998; Keane & Barlow, 2002; Kessler, Sonnega, Bromet, & Hughes, 1995). The data clearly underscore the importance of routine screening for PTSD in individuals living with HIV

and highlight the need to establish the psychometric properties of screening instruments for PTSD, such as the PCL, in this population. Screening instruments such as the PCL have great practical utility in health care settings where use of clinician-administered diagnostic measures would be prohibitively time-intensive and require trained evaluators.

Psychometric Properties and Diagnostic Utility of the PCL

To effectively screen for PTSD, a reliable and valid instrument must be used. The PCL, designed to assess severity of PTSD symptomatology (Weathers et al., 1993), has been shown to have excellent reliability across different populations of trauma survivors. Studies have reported coefficient alphas above .85 for the full scale, typically above .80 for each of the separate symptom clusters (Blanchard et al., 1996; Cook, Elhai, & Arean, 2005; Lang et al., 2003; Mueser et al., 2001; Ruggiero et al., 2003; Smith et al., 1999; Weathers et al., 1993) and test-retest reliability to be .96 (Weathers et al., 1993). Especially noteworthy is the fact the PCL has been shown to have excellent reliability in studies with patients who have a life-threatening cancer diagnosis (e.g., Andrykowski, Cordova, Studts, & Miller, 1998).

The construct validity of the PCL has also been well established in studies examining convergent and discriminant validity (Ruggiero et al., 2003; Smith et al., 1999). In assessing convergent validity, the PCL has demonstrated strong correlations with other measures of PTSD, specifically the Impact of Events Scale (Horowitz, Wilner, & Alvarez, 1979) and the Mississippi Scale for PTSD–Civilian version (Vreven, Gudanowski, King, & King, 1995), with reported coefficients greater than .77 (Ruggiero et al., 2003). In the only study to date that has assessed the validity of the PCL in a sample of individuals diagnosed with severe mental illness, PCL symptom cluster scores were found to correlate strongly with the symptom cluster scores of the Clinician-Administered PTSD Scale (CAPS; Mueser et al., 2001). Ruggiero and colleagues (2003) provided further support for the PCL's construct validity reporting moderate correlations with other measures of psychological distress, including the State-Trait Anxiety Inventory (Spielberger, 1983) and the Symptom Checklist 90-Revised (Derogatis, 1983). This study also provided evidence for discriminant validity, as correlations with other measures of PTSD were significantly higher than correlations with non-PTSD-focused measures of psychological distress (Ruggiero et al., 2003). Further support of validity was found by Smith and colleagues

(1999) who used the PCL to diagnose PTSD in a sample of bone marrow transplant survivors and then compared the groups on various measures of psychological distress. Individuals with a diagnosis of PTSD scored significantly higher on the Brief Symptom Inventory (BSI), Medical Outcomes Study Short Form-36 Health Survey (SF-36), and Impact of Events Scale (IES), than those without PTSD.

The utility of the PCL as a diagnostic screener for PTSD has also been established across different populations. Cut scores for optimum diagnostic efficiency have ranged from 30 to 50 depending on the characteristics of the specific sample (Blanchard et al., 1996; Cook, Elhai, & Arean, 2005; Dobie et al., 2002; Lang et al., 2003; Ventureyra, Yao, Cottraux, Note, & De Mey Guillard, 2002; Walker, Newman, Dobie, Ciechanowski, & Katon, 2002; Weathers et al., 1993).

PCL Factor Structure

Understanding the factor structure of the PCL is also important in furthering our knowledge about PTSD symptom structure. PTSD self-report measures such as the PCL have been developed to correspond to the three symptom clusters described in the *Diagnostic and Statistical Manual of Mental Disorders*-4th edition (DSM-IV; American Psychiatric Association, 1994). However, studies that have addressed the factor structure of the PCL reported mixed results, yielding support for two-, three-, or four-factor solutions (Asmundson, Wright, McCreary, & Pedlar, 2003; Cordova, Studts, Hann, Jacobsen, & Andrykowski, 2000; DuHamel et al., 2004; Shelby, Golden-Kreutz, & Andersen, 2005; Simms, Watson, & Doebbelling, 2002; Smith et al., 1999; Ventureyra et al., 2002; Weathers et al., 1993).

Studies finding a two-factor solution include those conducted by Weathers et al. (1993) and Asmundson et al. (2003). Weathers, whose sample consisted of Gulf War I veterans, found the first factor consisted of reexperiencing/avoidance/hyperarousal, while the second factor reflected numbing/hyperarousal (Weathers et al., 1993). Asmundson (2003), who used confirmatory factor analysis (CFA) with male UN peacekeepers, found the best fit to be a two-factor solution with reexperiencing and avoidance on factor one, and hyperarousal and numbing on factor two.

Two studies found support for a three-factor solution with the PCL. Using exploratory factor analysis (EFA) with an outpatient treatment-seeking sample, Ventureyra et al. (2002) found a three-factor solution (reexperiencing, numbing, and hyperarousal) with the French version of the PCL. Their identified factors appear to be conceptually consistent

with the DSM-IV criteria for PTSD (American Psychiatric Association, 1994). Further support for a three-factor solution was found using CFA with a sample of breast cancer survivors. In this study, a second-order model with three first factors consisting of reexeperiencing, avoidance/numbing, and arousal was found to have the best fit (Cordova et al., 2000).

Using EFA, Smith and colleagues (1999) found a four-factor solution for the PCL. The four factors, which were in part labeled for bone marrow transplant survivors, were numbing/arousal, dreams/memories of cancer treatment, hyperarousal, and responses to cancer-related reminders/avoidance-numbing. Upon closer review of the results, the first factor is primarily a numbing factor with only one arousal question (feeling irritable) loading on it. The second and third factors are clearly reexperiencing and hyperarousal, respectively. However, the fourth factor is a mix of avoidance/numbing and reexperiencing components. Simms et al. (2002), who also used CFA with a sample of deployed Gulf War I veterans, found a four-factor solution consisting of intrusion/reexeperiencing, avoidance, dysphoria/distress, and hyperarousal. In addition to finding that a two-factor solution fit their data for UN peacekeepers as mentioned earlier, Asmundson and colleagues (2003) also found a good fit for their data with a four-factor solution comprising reexperiencing, avoidance, numbing, and hyperarousal. Most recently, two separate studies with cancer patients using both EFA (Shelby, Golden-Kreutz, & Andersen, 2005) and CFA (DuHamel et al., 2004) found support for four-factor solutions. In addition, Marshall (2004) found a four-factor solution was the best fit for the data using CFA with both the PCL and a Spanish translation of the PCL. The factors that were identified in these recent studies were reexperiencing, avoidance, numbing, and hyperarousal (DuHamel et al., 2004; Marshall, 2004; Shelby, Golden-Kreutz, & Andersen, 2005).

The results from these studies share some commonalities and provide some empirical support for the PTSD symptom clusters presented in the DSM-IV (American Psychiatric Association, 1994). However, they do not provide a clear consensus on the factor structure of the PCL and raise the question of alternative solutions for understanding the symptom structure of PTSD. Particularly brought into question is the appropriateness of including avoidance and numbing under the same symptom category, as it is currently outlined in the DSM-IV. Clearly, additional research is needed to help understand which factors best represent the underlying structure of PTSD symptoms across clinical populations.

Study Aims

To date, no published study has examined the psychometric properties of the PCL in HIV-seropositive individuals. Previous studies of the PCL in medically ill patients have typically focused on survivors of cancer (e.g., Cordova et al., 2000; DuHamel et al., 2004). As with any assessment instrument, its use with a new population warrants investigation from a psychometric perspective. Empirical evaluation of the PCL structure in an HIV population will allow us to determine whether PCL subscales based on the DSM-IV accurately reflect the constellation of PTSD symptoms endorsed by HIV-positive individuals.

In addition to being HIV-seropositive, all participants in the study met criteria for a substance use and psychiatric disorder. Thus, this sample provided us with a unique opportunity to evaluate the properties of this commonly used screening instrument for PTSD in a population with comorbid disorders as well as life-threatening illness. To date, there has been little empirical evaluation of the PCL in populations with high rates of comorbidity, with the exception of one study of individuals with serious mental illness (Mueser et al., 2001).

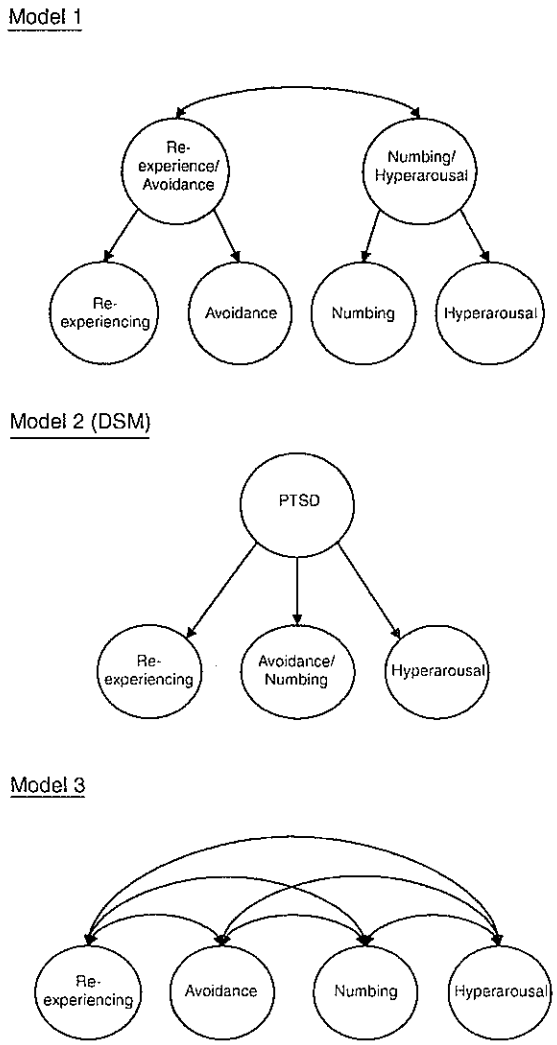
The first aim of this study was to evaluate the reliability and construct validity of the PCL in an HIV-seropositive population. The second aim was to test three different factor structures of the PCL using CFA in a sample of individuals living with a life-threatening illness and high rates of psychiatric and substance use disorder comorbidity. Based on findings from the extant research literature, the three most frequently supported models were tested. The first model was a four-first-order factors subsumed under two second-order factors model (Model 1), which is consistent with two-factor solutions. The second model corresponded with the DSM-IV PTSD diagnostic criteria, with three first-order factors subsumed under one second-order factor (Model 2). The third was a four-first-order-factors model (Model 3). Graphic representations of the models are presented in Figure 1.

METHODS

Participants

Participants were recruited as part of a longitudinal, multi-site study, the HIV/AIDS Treatment Adherence, Health Outcomes, and Cost Study.

FIGURE 1. Conceptual Representation of Tested CFA Models



This study was designed to evaluate the effects of integrated substance use, mental health, and HIV/AIDS primary care services on adherence to treatment, health outcomes, and health care costs. To be included in the multi-site study, potential participants needed to (1) have documented HIV-seropositivity; (2) be 18 years of age or older; (3) meet criteria for

a DSM-IV substance use disorder within the past year or be on methadone maintenance; and (4) meet criteria in the past year for at least one of a pre-selected group of other DSM-IV Axis I disorders (see Procedures for more details), with some symptoms of the disorder present in the past month, or meet criteria for Borderline or Antisocial Personality Disorder, or show evidence of a lifetime history of non-mood psychotic disorder. Potential participants were excluded from the study if they (1) showed evidence of acute withdrawal symptoms; (2) had a severe psychiatric condition (e.g., active psychosis) that would interfere with study procedures; (3) were currently suicidal or homicidal; (4) had a level of cognitive impairment sufficient to interfere with evaluation or treatment; (5) were unable to read or comprehend English at a level sufficient to provide informed consent or complete study procedures; or (6) did not receive care from one of the urban medical centers where the study was conducted.

Data for the current cross-sectional analyses in this paper were collected at two (Boston and New York) of the eight study sites in this multi-site study. These sites were unique in that they included the PCL in their baseline assessment. Participants were patients at one of three urban medical centers, two of which were located in Boston and one in New York City. A total of 224 participants, (Boston $N = 57$, New York $N = 167$) qualified for the current study.

Measures

Life Events Checklist (LEC). The LEC is a 17-item, self-report checklist from the Clinician-Administered PTSD Scale (CAPS; Blake et al., 1990) that assesses exposure to a range of potentially traumatic events (involving death, serious injury, or threat of death or injury) as defined in the DSM-IV PTSD Criterion A1. For each type of potentially traumatic event, the respondent is asked to indicate whether he/she directly experienced an event (experienced), whether they witnessed it (witnessed), or whether they learned that someone close to him/her had experienced an event of that type (learned about).

PTSD Checklist (PCL). The PCL (Weathers et al., 1993) is a 17-item, self-administered screening instrument for assessing the severity of PTSD symptomatology. Items cover the three DSM-IV established symptom clusters, including reexperiencing symptoms (5 items), numbing/avoidance symptoms (7 items), and hyperarousal symptoms (5 items). Respondents rate items for the past month on a 5-point scale ranging from 1 (Not at all) to 5 (Extremely). The original version of the PCL was de-

veloped and validated for use with combat veterans. It has subsequently been used to evaluate PTSD symptomatology in a variety of other populations, including predominantly female motor vehicle and sexual assault victims (Blanchard et al., 1996), adults in primary care (Cook, Elhai, & Arean, 2005; Lang et al., 2003; Spiro, Hankin, Leonard, & Stylinou, 2000; Stein, McQuaid, Pedrelli, Lenox, & McCahill, 2000; Walker et al., 2002), cancer survivors (Andrykowski et al., 1998; Smith et al., 1999), mothers of pediatric cancer survivors (Manne, Du Hamel, Gallelli, Sorgen, & Redd, 1998), and college students (Ruggiero et al., 2003). The civilian version of the measure was utilized in the present study. The PCL has demonstrated excellent reliability, with internal consistency (alpha coefficients) above .85 (Blanchard et al., 1996; Cook, Elhai, & Arean, 2005; Lang et al., 2003; Weathers et al., 1993) and test-retest reliability reported to be .96 (Weathers et al., 1993). The measure also manifests generally strong convergent and divergent validity (Blanchard et al., 1996; Ruggiero et al., 2003).

Although the PCL is primarily used as a measure of PTSD severity or as a screening instrument, the diagnostic utility of this measure has been established across different populations with results validated against such "gold standard" structured interviews such as the CAPS (Blake et al., 1990) and the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID; First, Gibbon, Spitzer, & Williams, 1996). Across studies, diagnostic utility is found to be high (.79 -.90) using varying cut scores (between 30 and 50) in different populations (Andrykowski et al., 1998; Blanchard et al., 1996; Manne et al., 1998; Spiro et al., 2000).

Structured Clinical Interview for DSM-IV Axis I Disorders (SCID- I/P) and Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II). A modified version of the SCID-I/P (First et al., 1996) and an abbreviated version of the SCID-II (First, Spitzer, Gibbon, & Williams, 1997) were used to assess the presence of a pre-selected group of Axis I and II diagnoses. The SCID-I/P and SCID-II are widely used, semi-structured clinical interviews designed to systematically assess psychiatric symptomatology and provide diagnoses based on DSM-IV (1994) criteria. The reliability of both Axis I and II diagnoses based on SCID administration is high (Segal, Hersen, & Van Hasselt, 1994).

Brief Psychiatric Rating Scale (BPRS). The expanded version of the BPRS (Van der Does, Linszen, Dingemans, Nugter, & Scholte, 1993) was used to evaluate current severity of psychiatric symptoms across a broad range of symptom categories. This adaptation is an expanded version of the original 16-item BPRS (Overall & Gorham, 1962). The 24 items include ratings of somatic concern, anxiety, depression, hostility,

elevated mood, grandiosity, bizarre behavior, self-neglect, conceptual disorganization, emotional withdrawal, and distractibility, among other indicators of psychiatric symptomatology. Each of the 24 items is rated on a 1 (Not present) to 7 (Extremely severe) scale with total scores ranging from 24 to 168, with higher scores indicating more severe symptoms of mental illness. The interrater reliability of the BPRS is generally acceptable with coefficients ranging from .67 to .88 (Ventura, Green, Shaner, & Liberman, 1993), with the mean reliability of the original 16 items being .83 (Overall & Gorham, 1962).

Medical Outcomes Study Short Form-36 Health Survey (SF-36). The SF-36 is a widely used, 36-item, self-report questionnaire that assesses perceptions of general health status (Ware & Kosinski, 2001; Ware, Kosinski, & Gandek, 2000). It consists of eight subscales tapping various physical and mental health constructs, including (1) physical functioning, (2) role limitations due to physical health problems, (3) role limitations due to emotional problems, (4) social functioning, (5) bodily pain, (6) vitality (energy/fatigue), (7) mental health, and (8) general health perceptions. The measure also yields both physical and mental health composite scores. The SF-36 possesses moderate to good internal consistency, with alphas ranging from .62 to .96, and most values above .70 (Ware et al., 2000). Test-Retest reliability is generally between .43 and .90, with all but one value above .60 (Ware et al., 2000). Further, the SF-36 demonstrates strong convergent validity with other measures of physical and mental health such as the Duke Health Profile, the General Health Rating Index (Ware et al., 2000) and the Sickness Impact Profile (Nanda, McLendon, Andersen, & Armbrecht, 2003).

Procedures

Potential participants were initially screened in a brief telephone or face-to-face interview. Those who met preliminary eligibility criteria were then invited to meet with study staff to receive an overview of the study design and to complete informed consent procedures. Participants were then scheduled for a comprehensive assessment to further evaluate their status on eligibility criteria and to gather baseline data. An evaluator trained in the various assessment measures and receiving ongoing supervision by a licensed clinical psychologist interviewed participants.

HIV status was verified through review of medical records or confirmation from the participant's HIV/AIDS primary care provider. Psychiatric diagnoses were established using the modified version of the SCID (SCID-I/P with psychotic screen; First et al., 1996) and an abbre-

viated version of the Structured Clinical Interview for DSM-IV Personality Disorders (SCID-II; First et al., 1997). Evaluators assessed for the presence of Substance Use Disorders, a pre-selected group of other Axis I (Major Depressive Disorder, Bipolar Disorder, PTSD, Panic Disorder, Generalized Anxiety Disorder, Adjustment Disorder, Mood Disorder with psychotic features, and Non-Mood Psychotic Disorder), and Axis II (Borderline and Antisocial Personality Disorders) diagnoses. Specified sections or modules of the SCID-I/P were skipped if the presence of certain Axis I diagnoses was detected. For example, Dysthymic Disorder was assessed only in the absence of Major Depressive Disorder in the past year. Generalized Anxiety Disorder was assessed only in the absence of Major Depressive Disorder and Dysthymia in the past year. Participants were diagnosed with Mood Disorder with Psychotic Features if they endorsed psychotic symptoms that occurred in the context of a mood episode (e.g., Major Depressive Disorder with psychotic features). Participants were diagnosed with Non-Mood Psychotic Disorder if they endorsed primary psychotic symptoms that did not occur in the context of a mood episode on the SCID-I/P psychotic screening module. The disorders assessed and skip patterns for diagnoses were established by the multi-site study Executive Committee on those most likely to occur in the population being studied.

Data Analyses

Reliability of the PCL was calculated using coefficient alpha to determine internal consistency, with values above .80 being considered acceptable (Anastasi, 1988). Construct validity was examined by calculating Pearson bivariate correlations between the PCL and other described measures of psychological distress.

Given the maturity of the research on the factor structure of the PCL, Confirmatory Factor Analysis (CFA) was used to determine whether the factor structure in this population fits with some of the previously reported models. CFA, unlike EFA, is a theory-testing technique rather than an exploratory technique which also allows for the comparison of competing models (Tabachnick & Fidell, 1996). Thus, we were able to test the fit of several hypothesized factor structures for posttraumatic stress symptoms in a new population where this had not previously been investigated.

Figure 1 illustrates the three conceptual models to be tested. Model 1 was a "four first-order factors subsumed under two second-order factors" model with reexperiencing and avoidance on one factor and

numbing and hyperarousal on the second factor. Model 2 was a "three first-order factors subsumed under one second-order factor" model, which is consistent with the DSM-IV conceptualization of PTSD (i.e., reexperiencing in factor one, avoidance/numbing in factor two, and hyperarousal in factor three). Finally, Model 3 was a "four-factor, first-order solution" with reexperiencing on factor one, avoidance on factor two, numbing on factor three, and hyperarousal on factor four.

In conducting CFA, recommendations suggest that it is useful to report multiple fit indicators (Tabachnick & Fidell, 1996). Fit indices presented are Chi-squared, Goodness of Fit Index (GFI), Normed Fit Index (NFI), Non-Normed Fit Index (NNFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA). It is noted that the NFI may underestimate good-fitting models with small sample sizes (e.g., below 10:1 ratio of cases to parameters); therefore, given the moderate sample size in the current study, the NNFI and the CFI are emphasized, as they are thought to provide better model estimation in smaller samples (Tabachnick & Fidell, 1996). Finally, we conducted chi-square analyses comparing the fit of alternative PCL symptom structure models to determine if the models differed significantly from one another.

RESULTS

Descriptives

The total study sample consisted of 224 participants. The average age of the participants was 43 years. The sample was evenly split between male and female (51 and 48%, respectively) with one participant identifying as male to female transgender. Almost half (48%) of the participants were Latino, 37% were African American, and 11% were Caucasian. Additional demographic data are presented in Table 1.

Examining the trauma history of participants, the most frequently endorsed experienced traumatic events were physical assaults (71.4%), life-threatening illness (68.3%), and assault with a weapon (54.0%). Number of experienced traumatic events ranged from 0 to 12 with a mean of 4.6 (SD = 2.6). Detailed data on endorsed events from the LEC are presented in Table 2.

A substantial number of participants reported a level of posttraumatic stress symptomatology consistent with PTSD. The scores on the PCL ranged from 17 to 81 with the mean for the sample being 42.2 (SD =

TABLE 1. Sample Descriptives

	Mean	*SD*	*Range*
Age	43.1	6.77	28-63
Education	10.8	2.30	3-18
	(N)	(%)	
Gender			
Male	115	51.3	
Female	108	48.2	
Transgender	1	0.4	
Ethnicity			
African American	84	37.5	
Latino/Hispanic	108	48.2	
Caucasian	25	11.2	
Native American	4	1.8	
Other	2	0.9	
Marital Status			
Never Married	101	45.1	
Married	39	17.4	
Remarried	1	0.4	
Widowed	25	11.2	
Separated	36	16.1	
Divorced	21	9.4	
Sexual Orientation			
Straight/Heterosexual	117	79.0	
Gay/Lesbian	16	7.1	
Bisexual	29	12.9	
Undecided/In transition/Not sure	2	0.9	

15.1). Using a cut score of 50 on the PCL (Weathers et al., 1993), 30.8% (N = 69) of participants screened positive for PTSD.

Reliability and Construct Validity

The internal consistency of the PCL (Cronbach's alpha) was .92 for the full measure. For reexperiencing, avoidance, and hyperarousal symptom clusters, alphas were .85, .81, and .80, respectively.

Construct validity was established by correlating the PCL scores with the BPRS Anxiety/Depression and Hostility subscales, and the SF-36 Role Emotional and Mental Health subscales. For each, correlations were

TABLE 2. Lifetime Trauma Exposure in Study Participants

Event	Experienced % (N)	Witnessed % (N)	Learned About % (N)
Natural Disaster	17.9 (40)	16.5 (37)	27.2 (61)
Fire/explosion	36.6 (82)	32.1 (72)	37.5 (84)
Transportation Accident	42.4 (95)	44.6 (100)	50.9 (114)
Serious accident	23.2 (52)	24.6 (55)	34.8 (78)
Toxic substances	11.6 (26)	9.8 (22)	15.2 (34)
Physical assault	71.4 (160)	69.2 (155)	64.3 (144)
Assault with a weapon	54.0 (121)	54.5 (122)	54.0 (121)
Sexual assault	29.5 (66)	9.8 (22)	37.9 (85)
Unwanted sexual experience	30.0 (47)	11.6 (26)	29.9 (67)
Combat/war zone	5.4 (12)	8.9 (20)	30.8 (69)
Captivity	8.0 (18)	10.3 (23)	17.0 (38)
Life-threatening illness	68.3 (153)	55.4 (124)	62.1 (139)
Severe suffering	29.9 (67)	34.4 (77)	37.5 (84)
Sudden violent death	N/A	36.6 (82)	50.4 (113)
Death of someone close	N/A	46.9 (105)	63.4 (142)
Harm caused	N/A	21.9 (49)	17.9 (40)
Other	17.9 (40)	12.1 (27)	16.1 (36)

moderate and statistically significant: Anxiety/Depression $r = .55$, Hostility $r = .48$, Role Emotional $r = -.52$, and Mental Health $r = -.52$, with all $p < .001$.

Factor Structure

Detailed CFA results are presented in Table 3. Fit indices indicate that Model 1 and Model 3 have almost identical fit to the data. Both models appear to have a good fit with indices of .90 or above, with the exception of the NFI (.88 for both models). For both of these models the RMSEA values of .07 are above the ideal RMSEA value of .05 or less. However, given the sensitivity of NNFI and CFI to sample size, these may be the best indices for evaluating the fit between the data and proposed models for PTSD symptom structure in this sample. Both of these indices (.92) indicated that Models 1 and 3 fit the data well. In evaluating Model 2, none of the fit indices were in the acceptable range (GFI = .87, NFI = .84, NNFI = .88, RMSEA = .08) with the exception of CFI (.90), therefore we conclude that the data do not support this model.

TABLE 3. Fit Indices and Chi-Square Difference Tests for CFA Models

Model	$\chi^2(df)$	$\Delta\chi^2$ (df)	p	GFI	NFI	NNFI	CFI	RMSEA
Model 1	222.36 (114)			.90	.88	.92	.93	.07
Model 2 (DSM)	286.79 (116)			.87	.84	.88	.90	.08
Model 3	218.65 (113)			.90	.88	.92	.94	.07
Model 1 vs. 2		64.43 (2)	.01					
Model 1 vs. 3		3.71 (1)	.10					
Model 2 vs. 3		68.14 (3)	.01					

Note: GFI = Goodness of Fit Index; NFI = Normed Fit Index; NNFI = Non-Normed Fit Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation

Chi-squared comparison of the models showed that both Model 1 and Model 3 were significantly better than Model 2. Model 1 and Model 3 were not significantly different from each other. These results support a first- and second-order, four-factor solution for the data.

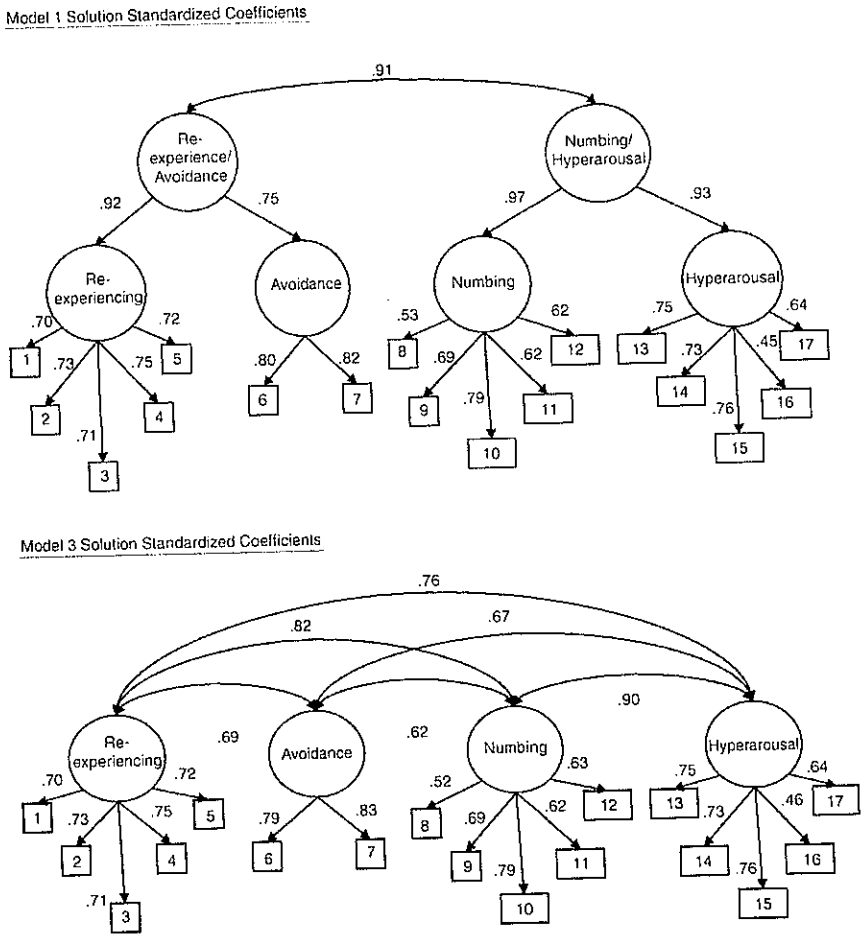
Figure 2 presents the standardized coefficients for all of the factors on the two models with the best fit of the data (Models 1 and 3). The regression weights were generally high and significant, indicating a strong relationship between the PCL items and their respective PTSD constructs.

DISCUSSION

The results of this study indicate that the PCL is a psychometrically sound instrument when used to screen for PTSD among HIV-seropositive individuals who also have substance use and psychiatric disorders. Consistent with previously reported findings, the PCL demonstrated high internal consistency. This was the case for the overall scale as well as for each of the DSM-IV-established symptom clusters. Construct validity was also supported by significant and moderate correlations between the PCL and measures of other psychological variables (e.g., depression, anxiety, and hostility) that are often related to PTSD symptomatology.

The results of the CFA indicated that our three-factor solution, which corresponds to a DSM-IV conceptualization of PTSD, was not the best-fitting model for the PCL data. Rather, four-factor second-order and four-factor first-order solutions provide the best fit. In the four-factor second-order solution, reexperiencing and avoidance were subsumed

FIGURE 2. Standardized Coefficients for Accepted Models



under one factor, while numbing and hyperarousal were subsumed under the second factor. The four-factor first-order solution included reexperiencing, avoidance, numbing, and hyperarousal each as its own factor. These findings are consistent with the results of previous studies which have found two- and four-factor models to be a better fit with PCL data than a three-factor solution (Asmundson et al., 2003; DuHamel et al., 2004; Shelby, Golden-Kreutz, & Andersen, 2005; Simms, Watson, &

Doebbelling, 2002; Smith et al., 1999; Taylor, Kuch, Koch, Crockett, & Passey, 1998; Weathers et al., 1993)

Our data provide only partial support for the DSM-IV-established PTSD symptom clusters. Consistent with the current DSM-IV diagnostic criteria for Clusters B and D, reexperiencing and arousal presented as unique and independent factors. However, in contrast to the DSM-IV structure of PTSD, which combines avoidance and numbing in a single factor (Criterion C), both models that provided the best fit for the current PCL data (Models 1 and 3) suggest that avoidance and numbing are separate and distinct factors. In Model 1, avoidance was grouped with reexperiencing while numbing was grouped with hyperarousal. In Model 3, avoidance and numbing were found to be distinct factors, as were reexperiencing and hyperarousal. Thus, the current findings suggest that it may be important to consider a new perspective on the dimensionality of PTSD symptomatology. At present, a diagnosis of PTSD requires that an individual endorse at least 1 reexperiencing, 3 avoidance/numbing, and 2 hyperarousal symptoms. Our data suggest that DSM-IV Criterion C may comprise two conceptually distinct symptom groupings, with one comprising trauma-specific avoidance symptoms and the other comprising generalized numbing symptoms. This conceptual division of Criterion C seems to support the argument of Foa, Zinbarg, and Rothbaum (1992) and Asmundson, Stapleton, and Taylor, (2004) who suggest that a more accurate presentation of the clinical picture of PTSD would place avoidance and numbing in different symptom clusters. Moreover, Model 1 (four-factor second-order solution) also supports Foa, Zinbarg, and Rothbaum's (1992) assertion that numbing occurs in response to chronic hyperarousal, while reexperiencing symptoms give rise to effortful avoidance.

If the diagnostic criteria were revised to be consistent with the best fitting models in the present study, then it may be necessary to alter the number of symptoms required for each symptom category and the pattern of symptoms needed to meet a diagnosis of PTSD. For example, the criteria would need to be revised to require endorsement of both avoidance and numbing symptoms. Of note, altering the diagnostic criteria may impact the number of people who are diagnosed with PTSD. For example, DuHamel et al. (2004) found that more cancer survivors met criteria for PTSD based on three-symptom cluster solution (consistent with DSM-IV) than a four-symptom cluster solution, which was actually the best for their data.

Consideration of alternative models of the structure of PTSD has important implications for clinical practice. Researchers have suggested

that treatment may need to be tailored to specific types of symptom presentation (Palmieri & Fitzgerald, 2005). For example, there is some evidence to suggest that cognitive-behavioral treatment for PTSD may be less effective for individuals with higher levels of pre-treatment emotional numbing (Taylor et al., 2001). Additional data suggest that exposure therapy may be more helpful in reducing symptoms of effortful avoidance than symptoms of emotional numbing (Taylor et al., 2003). Support for the four-factor second-order solution also implies that it may be important to consider the interrelationships between certain PTSD symptoms (e.g., reexperiencing and avoidance or hyperarousal and numbing) in designing and implementing treatment interventions.

Interestingly, the four-factor solutions supported in this study are similar to those identified in studies focused on other types of chronic traumas (e.g., cancer; see Shelby, Golden-Kreutz, & Andersen, 2005). However, in the current study, participants reported exposure to multiple and diverse traumatic events, including but not limited to being diagnosed with HIV. Thus, the majority were exposed to a number of discrete events in addition to having a chronic, life-threatening illness. As participants were not required to identify an index event, we are unable to determine whether the factorial solution for the PCL related to the experience of living with a chronic, life-threatening illness, exposure to a particular type of discrete event, or exposure to multiple traumas. Hence, additional research is clearly needed to further our understanding of PTSD symptom structure in the context of varied and/or multiple trauma exposure in an HIV population.

Historically, participants in studies examining the characteristics of the PCL have been primarily Caucasian, thereby limiting our ability to generalize findings to other cultural or racial groups. In contrast, participants in the current study were largely African American and Latino, with a notable minority (20%) self-identifying as Gay, Lesbian, or Bisexual. Thus, this study adds to our knowledge about the expression of PTSD symptomatology in minority populations and suggests that the PCL is psychometrically sound when used in a diverse sample.

One limitation of the current study is that other measures of PTSD were not included in analyses of convergent validity. For convergent validity of the PCL to be confirmed in a new population, the PCL should be correlated with other reliable and valid measures of PTSD severity.

In summary, this study provides additional evidence for high rates of trauma exposure among individuals living with HIV, substance use, and psychiatric disorders, and underscores the need for a reliable and valid screening instrument for use in HIV health care settings. It also provides

preliminary data on the psychometric properties of the PCL in an HIV population. Overall, results suggest that the PCL is a useful screening instrument for identifying probably cases of PTSD in individuals living with HIV. However, further research is needed to replicate these findings and to provide additional evidence of convergent validity for the PCL in an HIV population.

Results of the confirmatory factor analyses also suggest that it may be important to consider an alternative model of PTSD which separates the DSM-IV symptoms of avoidance and numbing. As this is the first study to examine the factor structure of the PCL in an HIV population, the results will need replication. In addition, further research is needed to help determine whether the four-factor second-order solution or the four-factor first-order solution provides the most accurate depiction of PTSD symptoms in this population.

NOTES

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